CURATING NASA'S EXTRATERRESTRIAL SAMPLES – PAST, PRESENT, AND FUTURE.

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Introduction: Curation of extraterrestrial samples is the critical interface between sample return missions and the international research community. The Astromaterials Acquisition and Curation Office at the NASA Johnson Space Center (JSC) is responsible for curating NASA's extraterrestrial samples. Under the governing document, NASA Policy Directive (NPD) 7100.10E "Curation of Extraterrestrial Materials", JSC is charged with ". . . curation of all extraterrestrial material under NASA control, including future NASA missions." The Directive goes on to define Curation as including "documentation, preservation, preparation, and distribution of samples for research, education, and public outreach."

Specifically, JSC is responsible for:

"The physical security, protection, preservation and environment of extraterrestrial materials in the JSC Curatorial Laboratories; and the suitable off-site storage of a representative sampling of the curated extraterrestrial materials."

"The development and maintenance of the system of detailed procedures through which the distribution of curated extraterrestrial materials are controlled, and the implementation of that system in conjunction with other NASA offices as necessary."

"The development and maintenance of a unified, thorough, and up-to-date set of procedures on control and security of curated extraterrestrial materials."

Extraterrestrial samples pose unique curation requirements. These samples were formed in environments strikingly different from that on the Earth's surface. Terrestrial contamination would destroy much of the scientific significance of many extraterrestrial materials. In order to preserve the research value of these precious samples, contamination must be minimized, understood, and documented. In addition the samples must be preserved – as far as possible – from physical and chemical alteration. The elaborate Curation facilities at JSC were designed and constructed, and have been operated for many years, to keep sample contamination and alteration to a minimum

At the current time JSC curates six collections of extraterrestrial samples:

- Lunar rocks and soils collected by the Apollo astronauts
- Meteorites collected on NSF-funded expeditions to Antarctica
- "Cosmic dust" collected by NASA aircraft
- Solar wind atoms collected by the Genesis spacecraft
- Comet particles collected by the Stardust spacecraft
- Interstellar dust particles collected by the Stardust spacecraft

Each of these sample sets has a unique history and comes from a unique environment. The JSC curators have developed specialized laboratories and practices over many years in order to preserve and protect the samples, not only for current research but "for studies that may be carried out in the indefinite future."

Lessons learned for the future from 40+ years curating NASA's extraterrestrial samples:

The main point of any sample return mission is laboratory analysis. Everything must be designed, built, and operated to get the highest quality samples to the best laboratories.

Curation starts with mission design. Samples will never be cleaner than the tools and containers used to collect, transport, and store them. It is critical to design and monitor spacecraft contamination control during manufacturing and operations.

We must be ready for contingencies. Really bad things can – and do – happen. Careful planning and dedicated people can sometimes save the day.

Every sample set is unique. Laboratories and operations must respond to the diversity and special requirements of the samples.

We are in it for the long haul. Samples collected years or decades ago are yielding new discoveries that totally change our understanding of planets, moons, and solar system history. These discoveries will inspire new generations of scientists and research questions, and will drive new exploration missions by robots and humans.